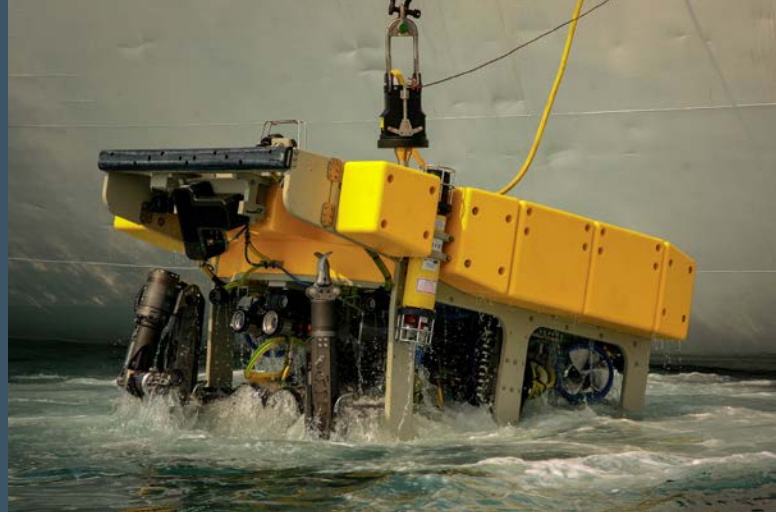
VICOR

Case study:
Tethered Underwater ROV



DC-DC transformer facilitates implementation of longer tether

Customer's challenge

Allowing an underwater ROV to perform remote inspection activities at greater depths required the tether from the ship-based power source be extended. Distributing the original design's low voltage over the longer tether was not practical due to voltage drops. Moving to a high-voltage 700V low-loss tether, however, required conversion to a lower SELV voltage onboard the ROV. This typically requires a custom converter that takes up space and adds weight, not feasible in an ROV that needs to be able to carry increased payloads. The key goals were:

- Extending the tether, required for deep or remote inspection, without loss of performance
- Avoid the high cost of a custom discrete power solution while saving space and weight
- Retain clear transmission of data via the tether for on-board sensors

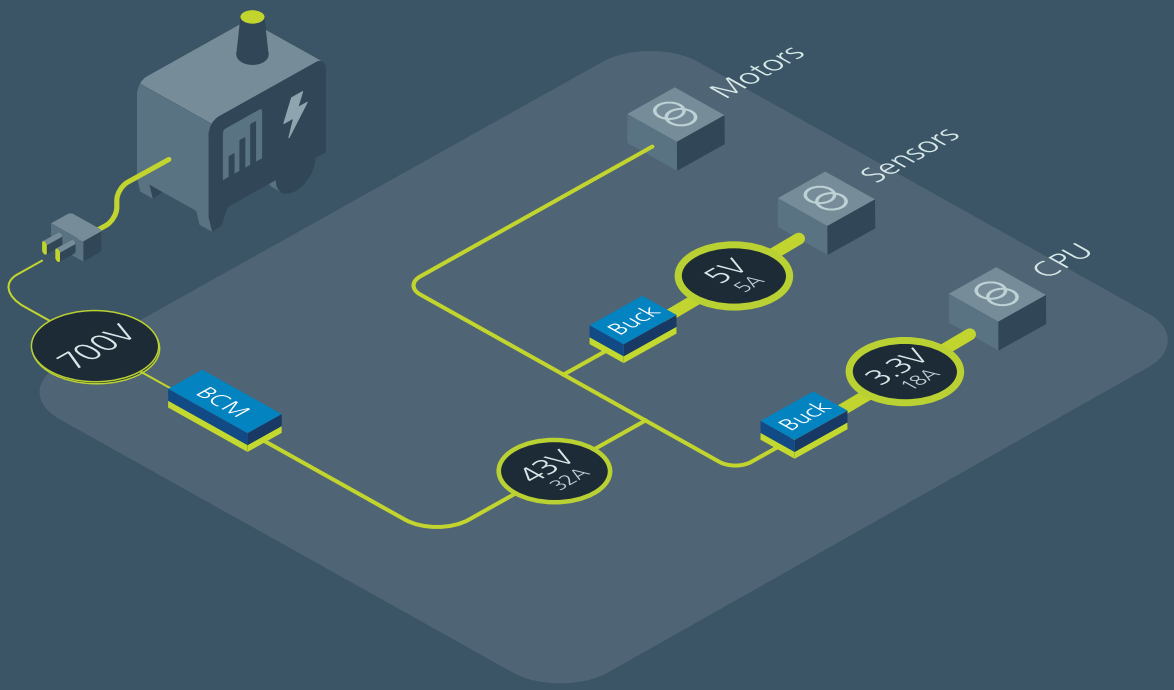
The Vicor solution

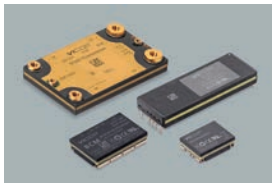
The extremely small, low weight BCM® Bus Converter, acting as a DC-DC transformer, converted the high voltage from the tether down to the 48V distribution architecture on board the ROV. It provided a simple, easy to implement, off-the-shelf solution. Key benefits were:

- High-voltage tether reduced the supply current, and thus losses for a given cross-section of copper conductor, allowing for a thinner, longer tether
- Reduced footprint of 1.5kW solution to just 41cm^2
- Low noise conversion topology prevented interference with communications over the tether

BCM bus converter module with a 400 – 700V input range greatly simplifies the implementation of high voltage supplies

The Power Delivery Network: The BCM isolated and stepped-down the high tether voltage input to a nominal 48V, a factor of 1/16. Output was 1.5kW in a footprint of just 39cm^2. The BCM provided enough power to drive 48V motors, thrusters and control electronics. Its high efficiency simplified the cooling within the vehicle. ZVS Buck regulators converted the 48V SELV distribution to 5V and 3.3V to power downstream points-of-load. To analyze this power chain, go to the **Vicor Whiteboard** online tool.





BCM® bus converter

Isolated fixed-ratio
Input: 800 – 48V
Output: 2.4 – 55.0V
Current: Up to 150A
Peak efficiency: 98%
As small as 22.0 x 16.5 x 6.7mm

vicorpower.com/bcm

ZVS buck regulator

Non-isolated regulated
Input:12V (8 – 18V), 24V (8 – 42V), 48V (30 – 60V)
Output: 2.2 – 16V
Current: Up to 22A
Peak efficiency: 98%
As small as 10.0 x 10.0 x 2.56mm

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